

the transverse metaphyseal sclerotic bands on radiographs, corresponding to each cycle of pamidronate. The reduction in pain and increase in well being and ability were impressive and agreed with other reports.^{5,6}

This study was observational, and intravenous treatment by enthusiastic investigators has a considerable placebo effect. A sensible interpretation of bone mineral density in small disabled children of abnormal proportions and composition is well nigh impossible. Fracture rates change unpredictably in osteogenesis imperfecta. Nevertheless these results are important.

The second option, to transplant normal osteoblast precursors, must be regarded as experimental.³ The skeleton is the home and protector of the bone marrow, which contains haemopoietic precursors and multipotential mesenchymal stromal cells capable of forming osteoblasts (as well as chondrocytes, fibroblasts, adipocytes, and muscle cells). Haemopoietic stem cells engraft and function after successful bone marrow transplantation; the evidence that in humans stromal cells can do the same is not convincing.

Horwitz et al took their cue from the mouse,³ where transplanted bone marrow-derived mesenchymal cells became incorporated into the bone and cartilage of sublethally irradiated transgenic mice with an osteogenesis imperfecta phenotype.⁷ Three children with severe osteogenesis imperfecta received allogeneic bone marrow transplants; in two osteoblast engraftment (1.5 and 2%) was shown. Bone mineral content and growth increased, bone histology improved, and the incidence of fractures fell; follow up described two more subjects, one with engraftment (Horwitz, International Conference on Osteogenesis Imperfecta, Montreal, 1999).

Interpretation of these results is controversial.^{8,9} In particular it is difficult to understand how the improvements described could result from the low percentage of engrafted normal osteoblasts. If transplanted stromal cells could permanently engraft in humans this would be a breakthrough.¹⁰ Hypophosphatasia could test this since there are biochemical indicators—alkaline phosphatase and its putative substrates—as well as clinical and radiological change.

A 6 month old girl with potentially lethal hypophosphatasia had bone marrow transplanted from a healthy sister, with rapid reversal of radiographic abnormalities and healing of “rachitic” defects.¹¹ Subsequent deterioration was followed by improvement after a non-T cell depleted boost with stromal cell expansion, again from her sister. Strangely there was never any evidence of biochemical improvement.

So where do we go from here? There is a danger that infants and children will be given powerful bisphosphonates indiscriminately and nothing will be learnt. It is important that a formal trial is conducted, however difficult that may be. For bone marrow transplantation there will be no rush. The investigators, rightly, regard their work as a test of principle and for the moment it should remain so.

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The cost of shoulder pain at work

Variation in work tasks and good job opportunities are essential for prevention

Shoulder pain is a common problem. In a recent large survey of musculoskeletal symptoms among the general population in the Netherlands, 21% of respondents reported having shoulder pain at the time of questioning.¹ The British Tameside study found a lower but still substantial estimated prevalence of 14%.² The one year prevalence is estimated to be 20-50% in several countries.³ Only about 40-50% of people with shoulder pain consult a primary care physician or general practitioner for it. Studies from primary care show that one year after a first consultation, 40-50% of patients report that their symptoms have persisted or recurred.⁴ Swedish insurance data show that 18% of disability payments

made for musculoskeletal disorders was spent on neck and shoulder problems.⁵ Thus, shoulder pain is widespread and imposes a considerable burden on the affected person and society.

Women seem to have more shoulder problems than men, and the frequency of shoulder pain increases with age. Smoking and previous trauma are associated with shoulder pain. People at high risk for shoulder pain include those working as cashiers, garment workers, welders, and bricklayers and those who work with pneumatic tools or in the meat industry. Hairdressers, plasterers, assembly workers, packers, and people who work for long hours at computers, such as secretaries and programmers, are also at high risk.

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Repetition and vibration

A recent systematic review of the literature by van der Windt et al looked at occupational risks for shoulder pain; risks were divided into physical factors (such as carrying or lifting heavy loads, working in awkward postures, engaging in repetitive movements, and being exposed to vibrations) and psychosocial factors related to work.⁶

The psychosocial factors examined included mental stress, job pressure, control at work (participation in decision making, influence on work schedule), social support (from coworkers and supervisors), and job satisfaction or stimulation at work (reflecting the content of the work and whether it was monotonous). In the 29 studies included in the review, consistent findings were found only for repetitive movements and work with vibrating tools. Working in awkward postures and performing similar work for a prolonged period were also associated with shoulder pain in most studies but mainly in those studies that received low scores for their methodology.

Nearly all studies that assessed work related psychosocial risk factors reported at least one positive association with shoulder pain, but the results were not consistent across studies. Van der Windt et al also found that the studies often lacked estimates of risk or had made limited adjustments for confounding. Additionally, exposures were often too poorly quantified to establish the relation between dose and response. The most important limitation, however, was the lack of longitudinal research, which makes it difficult to draw definite conclusions.

Recovery

Poor recovery from shoulder pain is associated with increasing age, severe symptoms, or recurrent symptoms at presentation, and a restricted range of passive abduction with concomitant neck pain.^{4,7} In contrast, mild trauma or overuse occurring before the onset of pain, early presentation, and acute onset are associated with a favourable prognosis.^{4,7} Individual psychosocial factors, such as a passive coping style, fear of movement, and general psychological distress, may play a part in the transition from acute to chronic pain. However, the empirical evidence for the role of these factors comes from studies on low back pain and neck pain.⁸

Few studies have examined the effect of work related factors on recovery. Ekberg and Wildhagen showed that whether a person took long term sick leave depended more on the work situation than on characteristics of the patient.⁹

Recently, evidence based guidelines, developed by occupational health physicians, for managing workers with low back pain have been issued in the Netherlands and the United Kingdom.^{10,11} Some of the recommendations may also apply to shoulder pain that develops in occupational settings. This would imply that efforts to prevent and treat shoulder pain should be directed at both physical and psychosocial factors, and initiatives should engage both employers and workers in attempts to identify and control risk factors and implement optimal programmes to enable employees to return to work.

People with shoulder pain should remain active and return to normal activity or temporarily modified work as soon as possible. In a later stage of the disease

a strategy for returning to work that integrates modified work, functional restoration, and cognitive behavioural treatment may be appropriate.

Prevention

Attention should also be paid to preventing shoulder pain at work. A recent consensus document suggests that the arm should not be extended behind the back or adducted in an extreme position for a substantial amount of time.¹¹ Work should not entail highly repetitive movements of the upper arm; in particular repetitive movements should not be done with force applied or when there is insufficient time to recover. Work that involves moving hands above shoulders or with the shoulder in extreme outward rotation should occur only for a short time. In addition prolonged work with vibrating tools should be avoided.⁵ Work tasks should be varied, with enough time allocated to do them, and employees should be offered opportunities for developing their jobs and influencing their work patterns. In secondary prevention there have been some promising results from a cognitive behavioural approach, which implies that addressing these factors may also reduce shoulder pain.^{12,13}

Evidence for the risk factors and prognostic indicators of shoulder pain should be studied longitudinally. Without data on the importance of each risk factor and the dose-response relation it is difficult to design effective preventive measures. Before implementation the cost effectiveness of these interventions should be carefully evaluated.

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